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| EXAMINER | |
|---|---|
| HO, ALLEN C | |
| ART UNIT | PAPER NUMBER |
| 2882 | |

DATE MAILED: 01/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application N . | Applicant(s) | |
|---|---|---|---|
| | 09/739,622 | CASTENMILLER ET AL. | |
| | Examiner | Art Unit | |
| | Allen C. Ho | 2882 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *28 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-16 and 18-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-16 and 18-35* is/are rejected.

7)☒ Claim(s) *11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 December 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "the three position measuring devices are arranged orthogonally with respect to each other" as claimed in claim 19 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

In Fig. 2, although each of the position measuring devices 10A and 10B is arranged orthogonally with respect to the position measuring device 10C, the position measuring devices 10A and 10B are not orthogonal to each other. Accordingly, the objection is being maintained.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 16 May 2003 has been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

### *Specification*

3. With regard to the amendment filed on 16 May 2003, the objection under 35 U.S.C § 132 has been withdrawn in view of the response from the applicant.

### *Claim Objections*

4. Claims 27-29 are objected to because of the following informalities: "apparatus" should be replaced by --device-- since they depend on claim 15. Appropriate correction is required.

5. Claims 22, 28, and 34 are objected to because of the following informalities: line 3, "the" in front of "one" should be deleted. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 22, 23, 25, 26, 28, 29, 31, 32, 34, and 35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The applicant fails to claim how the angle is measured. An angle must be defined by two intersecting sides or axes.

### *Claim Rejections - 35 USC § 103*

8. Claims 1-3, 7, 10, 12-16, 22, 25, 28, 31, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi (U. S. Patent No. 5,243,195) in view of Kanaya *et al.* (U. S. Patent No. 5,995,22).

With regard to claims 1-3, 7, 10, 15, Nishi disclosed a lithographic projection apparatus comprising: a projection beam illumination system which supplies a projection beam of radiation (inherent); a first object table (RST) for holding a projection beam patterning device (PA) which

patterns the projection beam according to a desired pattern; a second object table (WST) for holding a substrate (W); a projection system (PL) which images the patterned beam onto a target portion of the substrate; a reference frame (X, Y, Z); and three position measuring devices (IFX, IFY1, IFY2) comprising: three laser sources (inside the interferometer enclosures) mounted on the reference frame (stationary with respect to X, Y, Z), three radiation detectors (inside the interferometer enclosures) mounted in a fixed position on the reference frame (stationary with respect to X, Y, Z), and two mirroring devices (IMX, IMY) mounted on one of the object tables that is movable relative to the reference frame so as to reflect monochromatic collimated laser beams emitted by the laser sources toward the radiation detectors.

However, Nishi failed to teach that the radiation detector is a two-dimensional PSD, or a CCD, or a four-quadrant photo-detector.

Kanaya *et al.* disclosed a position measuring device that uses a two-dimensional CCD detector for measuring interference fringes.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a two-dimensional CCD for light detection, since a person would be motivated to use a two-dimensional detector to measure the two-dimensional interference fringe patterns produced by the movement of the second object table.

With respect to claims 12, 14 and 16, Nishi disclosed a method of manufacturing a device comprising: providing a substrate (W) provided with a radiation-sensitive layer (column 1, lines 11-16) to a second object table (WST); providing a projection beam of radiation using an illumination system (inherent); patterning the projection beam to form a pattern in its cross section (PA); projecting (PL) the patterned beam onto the target portions of the substrate; and

determining a reference position of the second object table relative to a reference frame (X, Y, Z) by: emitting radiation from a radiation source (IFX, IFY1, IFY2) mounted on the reference frame (stationary relative to X, Y, Z) toward a mirroring device (IMX, IMY) mounted on the second object table, reflecting the radiation, and detecting the reflected radiation in a radiation detector (IFX, IFY1, IFY2) mounted in a fixed position on the reference frame (stationary relative to X, Y, Z).

However, Nishi failed to teach that the radiation detector is a two-dimensional PSD, or a CCD, or a four-quadrant photo-detector.

Kanaya *et al.* disclosed a position detection device that uses a two-dimensional CCD detector for measuring interference fringes.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a two-dimensional CCD for light detection, since a person would be motivated to use a two-dimensional detector to measure the two-dimensional interference fringe patterns produced by the movement of the second object table.

With regard to claim 13, Nishi in combination with Kanaya *et al.* disclosed a method according to claim 12, further comprising: determining an absolute position (with respect to the X, Y, Z reference frame) of the second object table by measuring movements thereof relative to the reference position using the incremental position sensing system (IFX, IFY1, IFY2).

With regard to claims 22, 25, 28, 31, and 34, Nishi in combination with Kanaya *et al.* disclosed that the radiation source and the two-dimension radiation detector are mounted to the reference frame at a predetermined angle relative to the object table (inherent).

9. Claims 4, 8, 9, 21, 24, 27, 30, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi (U. S. Patent No. 5,243,195) and Kanaya *et al.* (U. S. Patent No. 5,995,22) as applied to claim 1 above, and further in view of Makinouchi (U. S. Patent No. 5,907,392).

With regard to claims 4, 8, and 9, Nishi in combination with Kanaya *et al.* disclosed the apparatus according to claim 1, comprising mirroring devices mounted on one of the object tables.

However, Nishi and Kanaya *et al.* failed to teach or fairly suggest that the mirroring device is a retro-reflector that comprises either a trapezoid form having three mutually perpendicular surfaces meeting at a corner, or a convergent lens and a reflective surface, the reflective surface being spaced a distance from the lens equal to the focal length of the lens.

Makinouchi disclosed an exposure apparatus that uses a retro-reflector (**13L**, **13R**) as a mirroring device mounted on a moving object table.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a retro-reflector that comprises a trapezoid form having three mutually perpendicular surfaces meeting at a corner as a mirror device, since a person would be motivated to use any thing that is functionally equivalent to a mirroring device on one of the object tables. Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to choose from among the known equivalents based solely on design choice absent any showing of criticality. The lack of criticality is demonstrated by applicant's claiming of a plurality of equivalent devices.

With regard to claims 21, 24, 27, 30, and 33, Nish in combination with Kanaya *et al.* and Makinouchi disclosed that the mirroring device is configured to reflect the radiation onto a return path parallel to and displaced from in incident path (Makinouchi, Fig. 5).

10. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi (U. S. Patent No. 5,243,195) and Kanaya *et al.* (U. S. Patent No. 5,995,22) as applied to claim 1 above, and further in view of Tei *et al.* (U. S. Patent No. 6,144,025).

With regard to claims 5 and 6, Nishi in combination with Kanaya *et al.* disclosed an apparatus according to claim 1, comprising a laser source.

However, Nishi and Kanaya *et al.* failed to teach or fairly suggest that the laser source comprises a laser diode mountable away from the reference frame, beam-directing optics mountable on the reference frame, and an optical fiber to couple the laser diode to the beam directing optics.

Tei *et al.* disclosed an interferometer comprising an optical fiber (**2**) that couples a laser diode (**1**) to the beam directing optics (**3**, **4**, **5**).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to introduce a laser beam using an optical fiber, since an optical fiber is much more flexible and convenient than optics for introducing a laser beam in a confined area.

11. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada *et al.* (U. S. Patent No. 6,163,369) in view of Kanaya *et al.* (U. S. Patent No. 5,995,22).

With regard to claims 18-20, Yamada *et al.* disclosed a lithographic projection apparatus comprising: a projection beam illumination system which supplies a projection beam of radiation (inherent); a first object table for holding a projection beam patterning device (reticle) which

patterns the projection beam according to a desired pattern (column 6, lines 12-15); a second object table (**3**) for holding a substrate (**2**); a projection system (**1**) which images the patterned beam onto a target portion of the substrate; a reference frame (X, Y, Z); and a position system including three position measuring devices (X-interferometer, Y-interferometer, Z-wafer surface position and inclination detection), each position measuring device comprising: a radiation source mounted on the reference frame (lasers **17** in the interferometers and illuminating light source **4**), a radiation detector (inherent for interferometers and a two-dimensional radiation detector **11**) mounted in a fixed position on the reference frame, a mirroring device (reference mirrors **15** for the interferometers and wafer surface for position and inclination detection) mounted on one of the object tables that is movable relative to the reference frame so as to reflect radiation emitted by the radiation source toward the radiation detector, wherein the position measuring devices are arranged orthogonal to each other.

However, Yamada *et al.* failed to teach that the radiation detector for the interferometer is a two-dimensional PSD, or a CCD, or a four-quadrant photo-detector.

Kanaya *et al.* disclosed a position detection device that uses a two-dimensional CCD detector for measuring interference fringes.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a two-dimensional CCD for light detection, since a person would be motivated to use a two-dimensional detector to measure the two-dimensional interference fringe patterns produced by the movement of the second object table.

***Response to Arguments***

12. Applicant's arguments filed 28 October 2003 have been fully considered but they are not persuasive.

Applicant argues that Nish's invention uses interferometers, which merely determine a relative change of position of the wafer stage and the reticle stage from a previous position, and they do not measure the position of either the wafer stage or the reticle stage with respect to a reference frame. The examiner does not dispute this statement. However, at some point the absolute position of the wafer stage and the reticle stage must be determined since everything must be measured relative to the reference frame; this is inherent since this is the reason for setting up a reference frame. The examiner never claimed that the interferometers are the position measuring devices; they are merely components of the position measuring devices that determine the absolute position of the wafer stage and the reticle stage.

Furthermore, applicant argues that there is no motivation for combining Nish and Kanaya *et al.* The examiner respectfully disagrees. In making the 103 rejections, the examiner never intended to combine the entire subject positioning device of Kanaya *et al.* with the lithographic projection apparatus of Nishi. The disclosure by Kanaya *et al.* was only relied upon to teach using a two-dimensional detector such as a CCD for measuring a two-dimensional interference fringe pattern in an interferometer. Therefore, it would have been obvious to a person of ordinary skill in the art to use a two-dimensional detector in Nishi's interferometer to measure a two-dimensional interference fringe pattern produced by a laser beam.

Finally, the examiner would like to reiterate what has been communicated to the applicant in the past office actions. The term "position measuring device" is only a label; it does

not convey or carry any structural limitations. An apparatus claim must be distinguished from the prior art in terms of structure rather than function. See MPEP § 2114.

### *Allowable Subject Matter*

13. Claim 11 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. Claims 23, 26, 29, 32, and 35 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

15. The following is a statement of reasons for the indication of allowable subject matter:

With regard to claims 23, 26, 29, 32, and 35, the prior art fails to teach or fairly suggest that the radiation source and the two-dimensional detector are mounted to the reference frame in such a way that a radiation beam emitted from the radiation source forms a 45° angle relative to either the x or the y-axis of the object table.

### *Conclusion*

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-1550.

Allen C. Ho
Patent Examiner
Art Unit 2882

ACH ACH 01.16.04

EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER